CLAIMS

1. An apparatus for preloading a torsion bar, comprising:

an adjuster arm adapted to be attached to and extend radially from a torsion bar, said adjuster arm having a free end with an involute surface formed thereon;

an adjustment nut adapted to be rigidly attached to a support member for the torsion bar adjacent a free end of said adjuster arm; and

an adjustment bolt threadably engaged in said adjustment nut, said adjustment bolt having a free end engaging said involute surface of said adjuster arm,

whereby when said adjuster arm is attached to the torsion bar and said adjustment nut is attached to the support member, rotation of said adjustment bolt rotates said adjuster arm and the torsion bar about a longitudinal axis of the torsion bar thereby changing a preload applied to the torsion bar.

2. The apparatus according to claim 1 wherein a longitudinal axis of said adjustment bolt remains perpendicular to said involute surface of said adjuster arm throughout the rotation of said adjuster arm.

3. The apparatus according to claim 1 wherein said free end of said adjustment bolt includes a tapered surface for smooth engagement with said involute surface of said adjuster arm.

4. The apparatus according to claim 1 wherein said involute surface of said adjuster arm is formed by an involute of an evolute circle determined by an equation $(xc + R)^2 + (yc)^2 = R^2$, wherein xc is an X axis distance of a point of contact between said adjustment bolt and said involute surface from a nominal position point of contact, wherein yc is a Y axis distance of the point

of contact from the nominal position point of contact, and wherein R is a radius of the circle.

5. The apparatus according to claim 4 wherein a radius of the circle is determined by the following equation:

$$r = \frac{\int_a^b \sqrt{(x(t) - xd)^2 + (y(t) - yd)^2}\, dt}{b - a}$$, wherein a and b are angular limits of rotation of said adjuster arm.

6. An adjustment mechanism for applying and adjusting a preload on a torsion bar in an automotive suspension system, comprising:

a torsion bar having an end rotatably supported in a vehicle support member;

an adjuster arm attached to and extending radially from said torsion bar, said adjuster arm having a free end with an involute surface formed thereon;

an adjustment nut rigidly attached to said support member adjacent said free end of said adjuster arm; and

an adjustment bolt threadably engaged in said adjustment nut, said adjustment bolt having a free end engaging said involute surface of said adjuster arm,

whereby rotation of said adjustment bolt rotates said adjuster arm and said torsion bar about a longitudinal axis of said torsion bar thereby changing a preload applied to said torsion bar, and

whereby a longitudinal axis of said adjustment bolt remains perpendicular to said involute surface at a contact point of said adjuster arm throughout the rotation of said adjuster arm.

7. The mechanism according to claim 9 wherein said free end of said adjustment bolt includes a tapered surface for smooth engagement with said involute surface of said adjuster arm.

8. The apparatus according to claim 1 wherein said involute surface of said adjuster arm is formed formed by an involute of an evolute circle determined by an equation $(xc + R)^2 + (yc)^2 = R^2$, wherein xc is an X axis distance of a point of contact between said adjustment bolt and said involute surface from a nominal position point of contact, wherein yc is a Y axis distance of the point of contact from the nominal position point of contact, and wherein R is a radius of the circle.

9. The apparatus according to claim 8 wherein a radius of the circle is determined by the following equation:

$$r = \frac{\int_a^b \sqrt{(x(t) - xd)^2 + (y(t) - yd)^2}\, dt}{b - a}$$

, wherein a and b are angular limits of rotation of said adjuster arm.